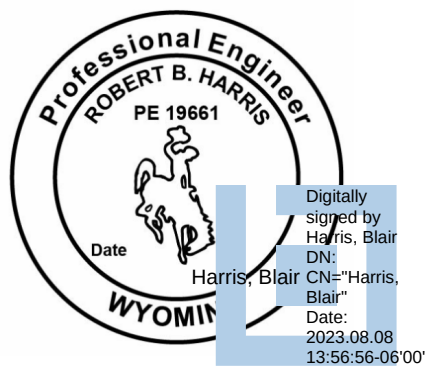
Structural Condition Assessment of Acme Power Plant

Acme, Wyoming



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Executive Summary

Ayres Associates was commissioned by WWC Engineering to perform a limited structural condition assessment of the Acme Power Plant, which is currently owned by the Sheridan County Conservation District. The Acme Power Plant is located along the Tongue River, north of Sheridan, Wyoming, on a 5-acre site within the former company town of Acme. This limited assessment was performed as follow up to a comprehensive structural evaluation performed by American Engineering Testing (AET) and shall be used as a supplementary report for the recommendations and findings outlined in AET's report with project number 19-20035, dated October 11, 2020. Ayres's structural condition assessment was conducted with the sole objective of reevaluating individual structural components whose conditions may have deteriorated since the initial evaluation and which may now pose potential life safety issues to workers required to perform upcoming asbestos management and subsequent demolition efforts. These findings and recommendations of the condition assessment are detailed within this report.

The observations and opinions expressed within this report are based on on-site observations of readily visible or accessible structural components at the time of the site visit and should not be construed as complete and exhaustive. Conditions noted are those which were explicitly observed at the time on-site. The progressive deterioration of structural elements prior to remediation work being performed should be anticipated given the current exposed condition of the partially open structure. Ayres Associates cannot report on hidden defects. This report does not constitute a warranty, either expressed or implied.

As part of the structural condition assessment, a site visit Blair Harris, PE was completed on June 27, 2023. The site visit was focused on identifying specific structural components of the power plant whose current condition may pose potential life safety hazard to future asbestos management and following demolition workers. Safety recommendations offered within this report are not intended to prevent further degradation of the structure and shall not be construed as such. The remedial action recommended for individual structural components observed to be in poor to severe condition are safety measures if workers are to be present within and around the structure during asbestos remediation and demolition efforts. Additional corrective actions are strongly recommended if it is ultimately decided the structure is to be remodeled and opened for adaptive reuse. Please reference the report summary for recommended safety recommendations.

Background

Purpose

WWC commissioned Ayres Associates to complete a limited structural condition assessment of the Acme Power Plant located north of the town of Sheridan, Wyoming. WWC requested Ayres to assess the newly observed structural degradation and collapse of the original 1910 reinforced concrete structural roof assembly. While on site it was also requested that Ayres would conduct a review of the original 2020 structural evaluation to monitor existing/noted areas of concern and identify potential new areas and structural components of concern as they relate to the safety of the future asbestos management and demolition workers and to provide safety recommendations.

It is understood by Ayres that the Owner has decided the power plant will ultimately be demolished following completion of the asbestos management plan and as such long-term structural stabilization recommendations are not included within this report. No structural recommendations nor analysis were performed as it pertains to the adaptive reuse or continual occupation of the structure outside of the construction workers needed to mitigate and demolish the structure from a safety perspective. If construction or demolition loading (i.e., mechanical equipment, demolition equipment, material debris piles, etc.) is determined by the General Contractor to be higher than serviceable capacities established within the 2020 AET Report of Structural Evaluation, Ayres shall be notified immediately for consultation.

Scope and Methods

The scope of services for this structural condition assessment included:

- Reviewing available documents related to the structure (such as pictures, construction drawings, maintenance records, reports, and other available documents).
- Completing a site visit to observe the condition of readily accessible structural components of the structure and document problem conditions that are observed or can be readily inferred without destructive testing.
- Compiling this document to summarize limited conditions observed during the site visit and to provide safety recommendations regarding areas of structural concern.

The observations made during the site visit were limited to the visible portions of the structure. The structure consists of various concrete, unreinforced masonry, and structural steel components. The site visit did not include observations of the portions of the structure that were not visible or accessible, or destructive testing of structural materials to determine material properties.

Ayres staff performed the limited observation on June 27, 2023. Observations were performed from accessible areas including the ground, structural floors, and steel catwalks. Structural walls were observed from both the interior and exterior. The original roof was observed from below from the interior and from a limited perspective above from catwalk access. The 1952 roof was observed from below. The below-grade cooling tunnels connecting the adjacent river to the structure were observed from within the structure, but observation and documentation was limited due to high levels of sediment deposited along the structural floor attributed to high levels of rain fall and a highly fluctuating water table that penetrated the basement level.

Observations were recorded via field notes, photographs, and videos during the site visit. Field notes describing the type of structure, material, and specific conditions are summarized in this report. Specific limitations impacting the visibility of the structure were also noted and included in this report. Photographs were taken where possible from safe vantage points. See Appendix A for photographs.

Conditions of the structure components were classified within four safety condition categories as they relate to the temporary construction occupancy of the structure ranging from: *satisfactory*, *poor*, *severe*,

and *unknown*. *Satisfactory* condition is defined to be showing minor signs of deterioration or aging; safety measures are only anticipated once the observed conditions worsen. *Poor* condition is defined as showing isolated deterioration or deficiencies; safety measures are recommended in the near future once the observed conditions worsen during worker occupancy. *Severe* condition is defined as showing large scale deterioration, deficiencies, or damage that will require immediate safety measures prior to worker occupancy. *Unknown* condition is assigned to structure components that could not be readily observed during the onsite inspection and should be further observed as opportunities arise during worker occupancy.

Structure Description

The power plant structure was designed and constructed in three phases, ranging from 1910 through 1950, to service heavy industrial loading typical of the time periods. Structural systems are comprised of multi-wythe unreinforced clay brick walls, structural steel joists/purlins and girders, and cast in place reinforced structural concrete roof and floors, and reinforced concrete slab on grade floors. For an in-depth description of the entirety of the original structure and its subsequent 1947 and 1950 additions refer to the aforementioned AET Report of Structural Evaluation, pages 3-6.

Follow Up Observations and Recommendations

Ayres Associates completed a site visit on June 27, 2023. The observations performed were in effort to evaluate the present structural conditions documented within the 2020 structural report and to note only areas of significant degradation which could pose potential life safety issues for construction workers. Previously noted areas of concern, unless shown to present signs of noted deterioration from a safety perspective, are omitted from this report for clarity. For an in-depth description of the existing structural conditions not mentioned within this limited assessment report refer to the aforementioned AET Report of Structural Evaluation, pages 9-12.

The following sections contain a brief description of the observed structural components, the observed conditions of the components, as well as associated safety recommendations.

1910 Original Power Plant

Reinforced Concrete Basement Structural Slab on Grade

The basement of the 1910 power plant was documented in the 2020 AET report to be in an overall satisfactory condition that would not indicate a reduction to the original design capacity of the structure. The one exception noted in the previous report was a steel beam spanning across the ash tunnel which was moderately deteriorated. Although further deterioration was not observed, without further investigation it is recommended this area should see limited construction loading and periodically monitored during the asbestos management and subsequent demolition process.

The basement floor of the 1910 power plant was limitedly observed due to a significant sedimentation accumulation/buildup throughout the top of concrete floor. The floor showed visible signs of new structural degradation at the cooling tunnel where it appears rising water levels may have created a hydrostatic uplift surcharge exceeding the capacity of the structural slab. The crack appears to occur along a construction and/or control joint above the tunnel and propagates along the joint to the other tunnel opening and slab penetration. (See Figures 1-2 in Appendix A)

The overall condition of the basement structural slab was observed to range from unknown to satisfactory to poor due to the presence of isolated areas of slab cracking. Safety recommendations include partitioning/roping off areas where the slab is not supported directly on grade and cracking is observed above or near openings and tunnels. Where unknown conditions of the floor slab exist, those areas

should be pressure washed/cleaned as deemed appropriate given the presence of asbestos contaminants to remove the accumulated sediment and exposed the top of slab for visible inspection so other areas of potential concern may be identified and partitioned as required for worker safety.

Reinforced Concrete First Floor Structural Slab

The first floor of the 1910 power plant was documented in the 2020 AET report to be in overall satisfactory condition that “wouldn’t overall reduce the original design capacity of the structure.” The generator room is a cast-in-place concrete construction supported by steel wide flange beams. Similar to the roof, “expanded metal, diamond mesh” provides the required composite tension steel reinforcing for the elevated concrete structural slab. The remainder of the first floor is a concrete slab on grade.

The overall condition of the first-floor structural slab was observed to be satisfactory at the time of our site visit. However, given the recently exposed nature of the first floor due to the partially open/collapsed roof structure, it is recommended for worker safety that the first-floor structural system should be periodically inspected prior to construction occupancy for progressive and unobserved degradation due to anticipated water penetration, ponding, and potential damage due to seasonal freeze-thaw cycling.

Reinforced Concrete Roof Structural Slab

The roof of the 1910 power plant was documented in the 2020 AET report to be in poor condition in select areas. It was initially recommended that the original roof would require a combination of repair and replacement. In the time elapsed between the 2020 AET assessment and this follow up condition assessment, large portions of the cast in place concrete roof slab have experienced catastrophic structural failure/collapse. Further observation has revealed failure mechanisms which make the original roof in its entirety an unsafe area for construction workers due to the high likelihood of crack and failure propagation even at areas which show limited signs of structural degradation. In addition, without the top of wall bracing provided by the roof diaphragm in the failed area, the top of brick wall could be viewed as only partially braced by the existing steel purlins. While failure of the wall isn’t expected, isolated disconnected bricks pose the risk of failing from the top of wall. (Figure 3-7)

The current overall condition of the original 1910 roof structural slab was observed to be in serious condition due to the failure of large areas of the cast in place concrete roof and the life safety hazard posed by failing large concrete/masonry debris with potential construction workers present below. Safety recommendations include providing horizontally placed heavy duty construction debris drop netting complying with OSHA regulations and conforming to ANSI A10.37 standards. It is recommended that the drop netting be installed as high as possible to reduce the force from potential failing debris. It is recommended drop net anchorage be placed at existing steel purlin locations and at steel girder locations where the purlins bear. Where the netting needs to anchor/connect to the existing clay masonry walls, it is recommended that thru-eye bolted connections with square plate washers be used to adequately anchor the netting to the clay brick walls. Pressure treated 2x members of sufficient length/width could also be used in lieu of steel plate washers to engage more brick and limit anchorage pull-out. (Figure 8) Ayres has not performed a structural analysis regarding the capacity of the existing structural members as they pertain to the required debris protection system nor the required debris protection connection types and spacing. The required debris fall protection system and associated connections are considered means and methods to be established by the General Contractor.

Summary

Structural components observed by Ayres to be in satisfactory condition at the time of the site visit were omitted from this report. Structural components observed by Ayres to be in conditions ranging from poor to serious from a safety perspective have been included along with safety recommendations to allow workers to occupy the structure during asbestos management activities. Structure components considered to be in *poor* condition were showing isolated deterioration or deficiencies and limited remedial safety action in these select areas is recommended during worker occupancy; structure components considered to be in *severe* condition were showing deterioration, deficiencies, or extensive damage/failure to the extent that immediate remedial safety action is recommended prior to the worker occupancy of the structure for asbestos management operations.

If anticipated construction or demolition loading (i.e., mechanical equipment, demolition equipment, material debris piles, etc.) is determined by the General Contractor to be higher than serviceable capacities established within the 2020 AET Report of Structural Evaluation, or if newly observed structural deterioration is observed due to the prolonged exposure of individual structural components, workers should immediately be restricted from occupying those areas of concern and Ayres should be notified as soon as possible for further consultation.

The observations and opinions expressed in this report are based on on-site observations of readily accessible structure components from a site visit performed by Ayres Associates, along with supplementary structural information provided in AET's 2020 Structural Evaluation Report. It should not be construed as complete and exhaustive. Conditions reported on are those that were readily accessible to visual observation. Ayres Associates cannot report on hidden defects. This report does not constitute a warranty, either expressed or implied.

Appendix A

Site Visit Photographs

Figure 1

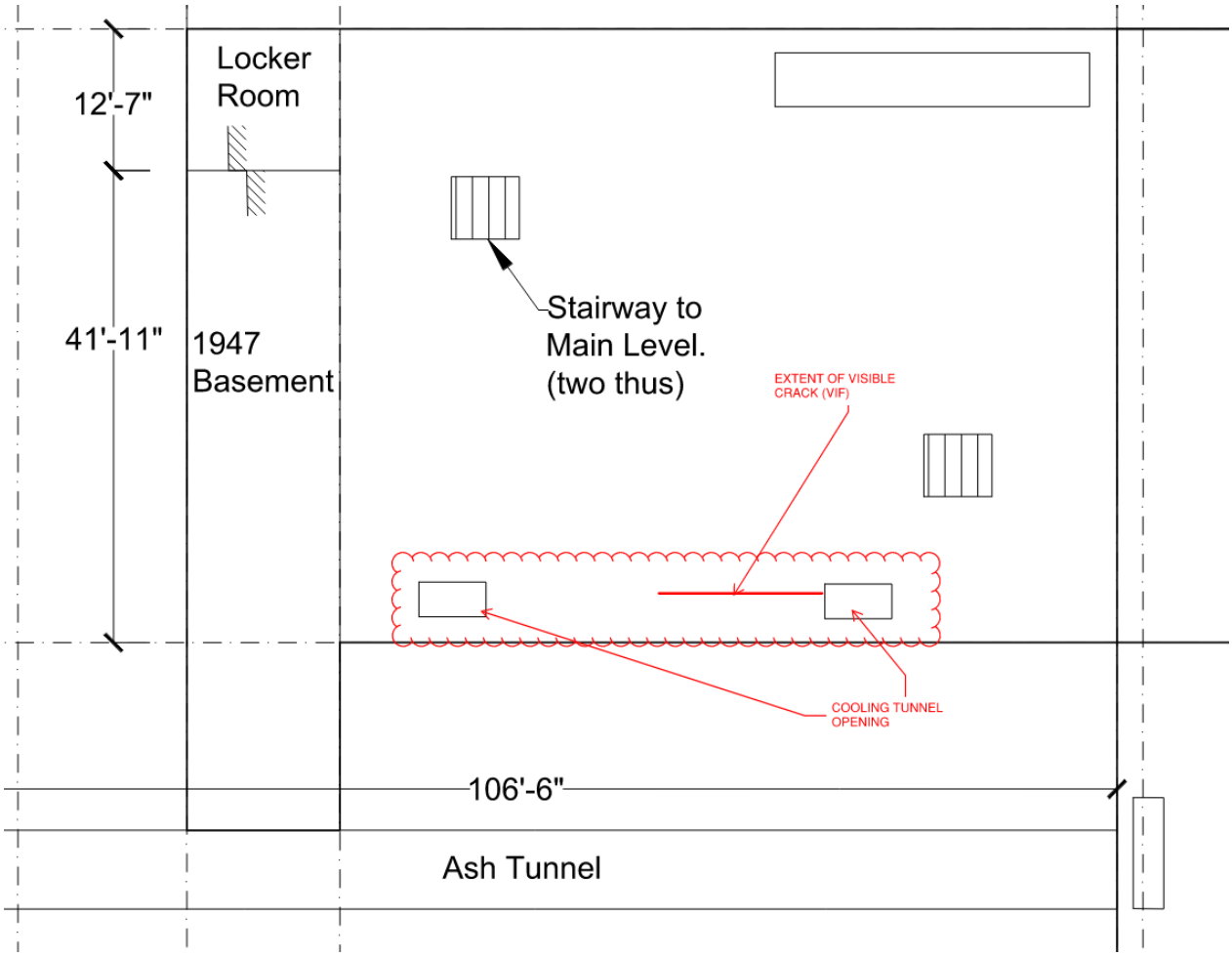

Figure 2 (Partial Basement Plan)


1947 Bldg
1910 Building
1950s Bldg
Tongue river
AREA OF OBSERVED
FAILURE/COLLAPSE.

Figure 3

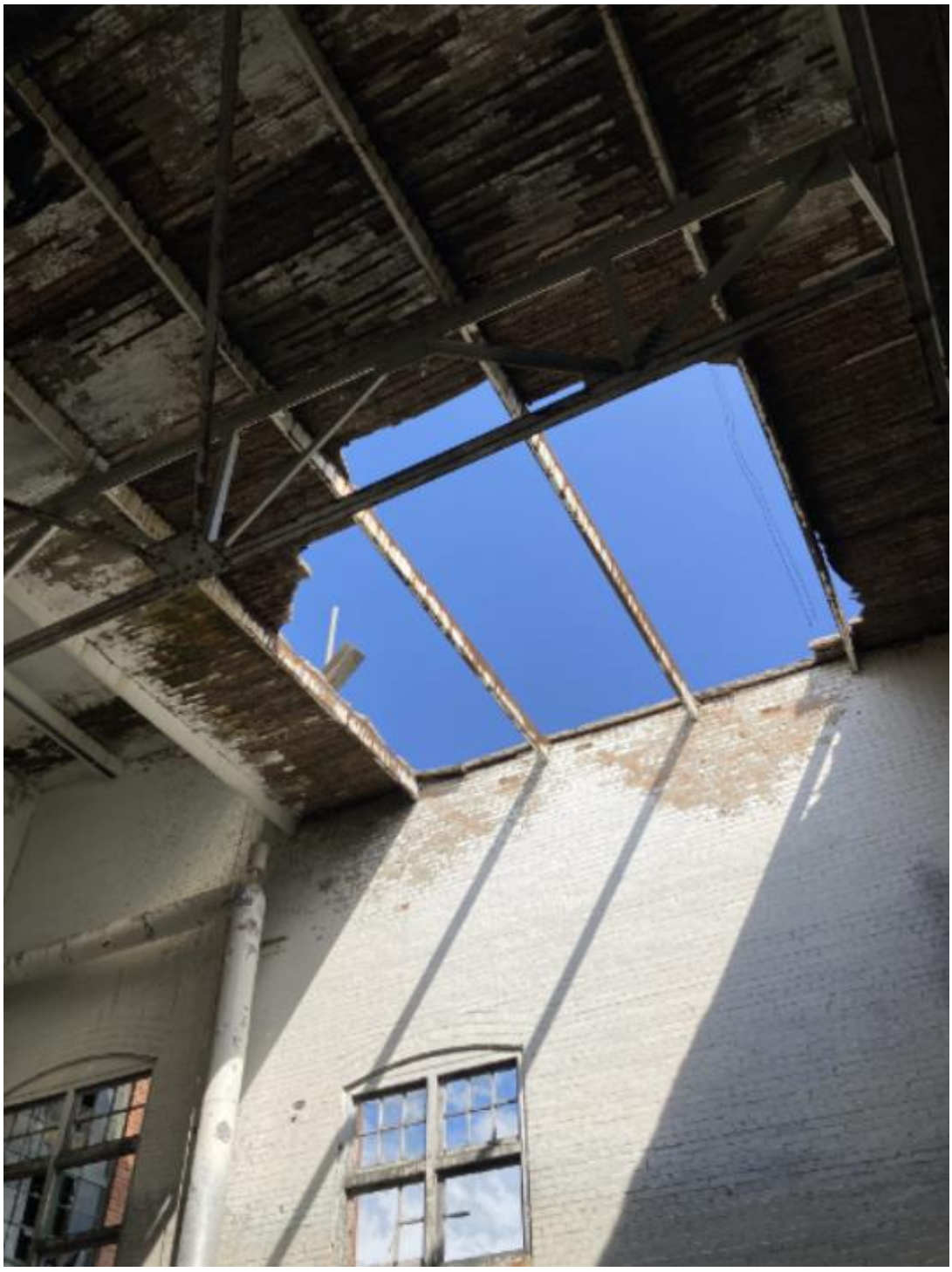

Figure 4

Figure 5

Figure 6

Figure 7

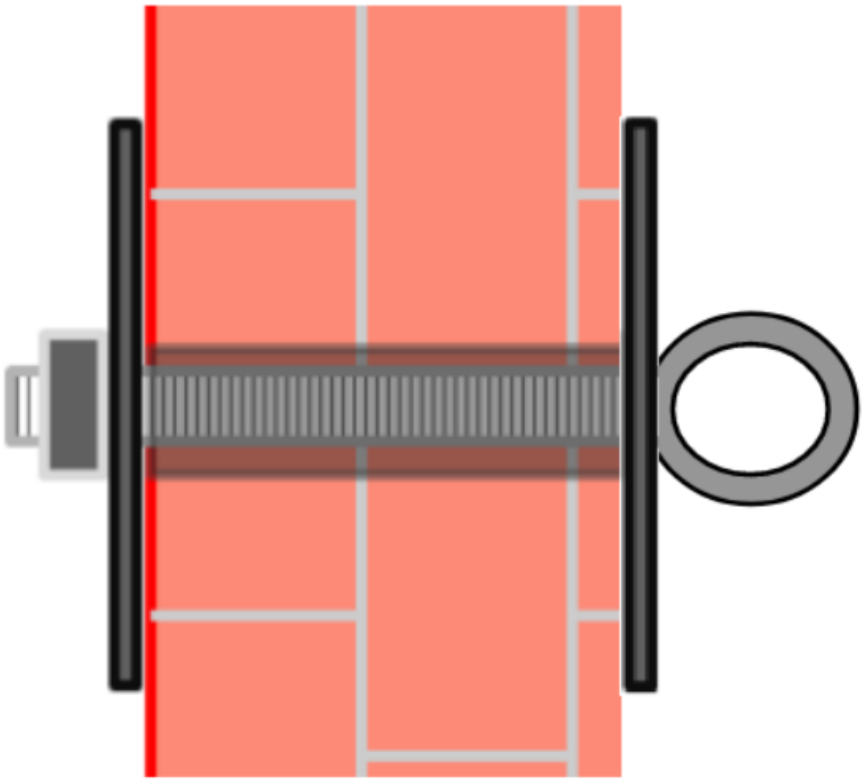

Figure 8